

CLAIMS

What is claimed is:

1. A network element capable of routing a signaling message based at least in part on a Circuit Identification Code (CIC) parameter that is specified within the signaling message, the network element comprising:
- (a) a first communication module capable of transmitting messages to and receiving messages from a first communications network;
  - (b) a second communication module capable of transmitting messages to and receiving messages from a second communications network;
  - (c) a CIC Routing Database (CRD) that is uniquely keyed or indexed at least in part by CIC values and that contains routing instructions associated with each unique key or index value; and
  - (d) a message routing process associated with one of the first and second communication modules for performing a lookup in the CIC routing database based on information extracted from a first message received by one of the first and second communication modules to locate routing instructions for the first message.

2. The network element of claim 1 wherein the first message is a Signaling System 7 (SS7) signaling message.
3. The network element of claim 2 wherein the SS7 signaling message is an ISDN User Part (ISUP) message signaling unit (MSU).
4. The network element of claim 3 wherein the ISUP MSU is intended to setup a voice-type call through a data network.
5. The network element of claim 4 wherein the data network is an Internet Protocol (IP) network.
6. The network element of claim 4 wherein the data network is an Asynchronous Transfer Mode (ATM) network.
7. The network element of claim 4 wherein the data network is the Internet.
8. The network element of claim 1 wherein the first communications network is an SS7 network.
9. The network element of claim 1 where the second communications network is an Internet Protocol (IP) network.

10. The network element of claim 1 wherein the first communication module is a Signaling System 7 (SS7) Link Interface Module (LIM).
11. The network element of claim 1 wherein the second communication  
5 module is an Internet Protocol (IP) capable Data Communication Module (DCM).
12. The network element of claim 1 wherein each CRD database record includes an IP address associated with a Media Gateway Controller  
10 (MGC) type node.
13. The network element of claim 1 wherein the CIC routing database contains a plurality of records and each record includes operational status information associated with a Media Gateway Controller (MGC)  
15 type node.
14. The network element of claim 1 wherein the CIC routing database contains a plurality of records and each record includes ownership information associated with a Media Gateway Controller (MGC) type  
20 node.
15. The network element of claim 1 wherein the CIC routing database contains a plurality of records and each record includes an accounting or billing indicator associated with a Media Gateway Controller (MGC)  
25 type node.

16. The network element of claim 1 wherein the first communication module comprises an SS7 link interface module (LIM) and the message routing process resides on the LIM.
- 5 17. The network element of claim 1 wherein the second communication module comprises an SS7 Data Communications Module (DCM) and the message routing process resides on the DCM.
18. The network element of claim 1 where the data that comprises the  
10 CRD database is maintained in high speed, random access memory.
19. The network element of claim 1 where the data that comprises the CRD database is maintained on high speed, optical disc storage media.
- 15 20. The network element of claim 1 wherein the message routing process is adapted to examine the type of messages received by the first and second communication modules and to perform the lookup in the CIC routing database in response to determining that the message is an  
20 ISDN user part (ISUP) message.
21. The network element of claim 1 wherein each key or index value includes an SS7 Destination Point Code (DPC) value and a CIC value.

22. The network element of claim 21 wherein each key or index value further includes an SS7 Origination Point Code (OPC).

23. The network element of claim 1 further comprising an Accounting Subsystem that is adapted to receive and process a second message associated with the first message that requires CIC based routing.

24. The network element of claim 23 wherein the second message is a copy of the first message received by the network element.

25. The network element of claim 24 wherein the second message is encapsulated within a Signaling Connection Control Part (SCCP) envelope.

26. The network element of claim 23 wherein the Accounting Subsystem includes a usage and measurements application.

27. The network element of claim 23 wherein the Accounting Subsystem includes a billing application.

~~28.~~ A method for routing a message in a communications network based on Circuit Identification Code (CIC) information contained within the message, the method comprising:

- (a) receiving a message having an SS7 destination point code value (DPC), an SS7 origination point code (OPC) value, and a CIC value from a first communication network;
- (b) determining whether the message is an ISDN User Part (ISUP) message;
- (c) in response to determining that the message is an ISUP message, performing a lookup in a CIC Routing Database (CRD) using key information contained in the message;
- (d) using information returned by the CRD lookup to select an appropriate outbound communication link on which the message may be transmitted; and
- (e) transmitting the message over the outbound communication link into a second communication network.

29. The method of claim 28 wherein the message is a Signaling System 7 (SS7) signaling message.

30. The method of claim 29 wherein the SS7 signaling message is an ISUP message signaling unit (MSU).

31. The method of claim 28 wherein the first communication network is an SS7 network.

32. The method of claim 28 where the second communication network is an Internet Protocol (IP) network.

33. The method of claim 28 wherein determining whether the message is an ISUP message includes examining a Message Type parameter contained within the message.
- 5 34. The method of claim 28 wherein the key information used in the CRD lookup is the combination of DPC and CIC values contained in the message.
35. The method of claim 34 wherein the key information further includes  
10 the OPC value contained in the message.
36. The method of claim 28 wherein the information returned by the CRD database includes a network address.
- 15 37. The method of claim 28 wherein the wherein the information returned by the CRD database includes an IP address and a port number.
38. The method of claim 28 wherein the information returned by the CRD database includes a status value that indicates the operational status  
20 of a particular network node.
39. The method of claim 28 further including, in response to determining that the message is an ISUP message, generating a copy of the ISUP message.

40. The method of claim 39 comprising delivering a copy of the ISUP message to an Accounting Subsystem.
41. The method of claim 40 wherein delivering a copy of the ISUP message to an Accounting Subsystem comprises encapsulating the copy of the ISUP message in a Service Connection Control Part (SCCP) envelope and delivering the encapsulated message to the Accounting Subsystem.
42. The method of claim 40 wherein the Accounting Subsystem includes a usage and measurements application.
43. The method of claim 40 wherein the Accounting Subsystem includes a billing application.
- ~~44.~~ A method of routing a message from a first network element in a first communication network to a second network element in a second communication network, the method comprising:
- (a) sending, from a first network element in a first communication network, a first message that includes an Origination Point Code (OPC) value, a Destination Point Code (DPC) value, and a Circuit Identification Code (CIC) value;
- at a CIC routing node:
- (b) receiving the first message;



- (c) performing a lookup in a CIC Routing Database (CRD) using key information contained in the first message;
- (d) forming a second message, that is based on the first message, using information returned by the CRD lookup operation; and
- 5 (e) routing the second message to a second network element in a second communication network.

45. The method of claim 44 wherein the first message is a Signaling System 7 (SS7) signaling message.

10 46. The method of claim 45 wherein the SS7 signaling message is an ISDN User Part (ISUP) message.

15 47. The method of claim 44 wherein the first communication network is an SS7 network.

48. The method of claim 44 where the second communication network is an Internet Protocol (IP) network.

20 49. The method of claim 44 wherein the key information used in the CRD lookup is the combination of DPC and CIC values contained in the first message.

25 50. The method of claim 49 wherein the key information further includes the OPC value contained in the first message.

51. The method of claim 44 wherein the information returned by the CRD database includes a network address.
52. The method of claim 44 wherein the information returned by the CRD database includes an IP address and a port number.
53. The method of claim 44 wherein the information returned by the CRD database includes a status value that indicates the operational status of the second network element.
54. The method of claim 44 further including generating a copy of the first message.
55. The method of claim 54 comprising delivering a copy of the first message to an Accounting Subsystem associated with the CIC routing node.
56. The method of claim 55 wherein delivering a copy of the first message to an Accounting Subsystem comprises encapsulating a copy of the first message in a Signaling Connection Control Part (SCCP) envelope and delivering the encapsulated message to an Accounting Subsystem associated with the CIC routing node.
57. The method of claim 55 wherein the Accounting Subsystem includes a usage and measurements application.

58. The method of claim 55 wherein the Accounting Subsystem includes a billing application.
59. The method of claim 44 wherein the first network element is a Service Switching Point (SSP).
60. The method of claim 44 wherein the second network element is a Media Gateway Controller (MGC).
61. The method of claim 44 wherein the second message is an IP encapsulated ISUP message.
62. The method of claim 44 wherein the second message is a Session Initiation Protocol (SIP) formatted message.
63. The method of claim 44 wherein the second message is an H.323 formatted message.
- ~~64.~~ A method of routing a message that is addressed to a point code which is shared by a plurality of network elements in a communication network, the method comprising:  
at a CIC routing node:  
(a) receiving a first message that includes an Origination Point Code (OPC) value, a Destination Point Code (DPC) value, and a Circuit Identification Code (CIC) value;

- (b) performing a lookup in a CIC Routing Database (CRD) using key information contained in the first message;
- (c) forming a second message, that is based on the first message, using information returned by the CRD lookup operation; and
- 5 (d) routing the second message to one of a plurality of network elements that share the DPC value specified in the first message.
65. The method of claim 64 wherein the first message is a Signaling System 7 (SS7) signaling message.
- 10 66. The method of claim 65 wherein the SS7 signaling message is an ISDN User Part (ISUP) message.
- 15 67. The method of claim 64 wherein the key information used in the CRD lookup is the combination of DPC and CIC values contained in the first message.
68. The method of claim 67 wherein the key information further includes the OPC value contained in the first message.
- 20 69. The method of claim 64 wherein the information returned by the CRD database includes a network address.

70. The method of claim 64 wherein the information returned by the CRD database includes an IP address and a port number.
71. The method of claim 64 wherein the information returned by the CRD database includes a status value that indicates the operational status of the second network element.
72. The method of claim 64 further including generating a copy of the first message.
73. The method of claim 72 comprising delivering the copy of the first message to an Accounting Subsystem associated with the CIC routing node.
74. The method of claim 72 comprising encapsulating the copy of the first message in a Signaling Connection Control Part (SCCP) envelope and delivering the encapsulated message to an Accounting Subsystem associated with the CIC routing node.
75. The method of claim 73 wherein the Accounting Subsystem includes a usage and measurements application.
76. The method of claim 73 wherein the Accounting Subsystem includes a billing application.

77. The method of claim 64 wherein the plurality of network elements include Media Gateway Controllers (MGCs).
78. The method of claim 64 wherein the second message is an IP encapsulated ISUP message.
79. The method of claim 64 wherein the second message is a Session Initiation Protocol (SIP) formatted message.
80. The method of claim 64 wherein the second message is an H.323 formatted message.
- ~~81.~~ A computer program product comprising computer-executable instructions embodied in a computer-readable medium for performing steps comprising:
- at a CIC routing node:
- (a) receiving a first message that includes an Origination Point Code (OPC) value, a Destination Point Code (DPC) value, and a Circuit Identification Code (CIC) value;
  - (b) performing a lookup in a CIC Routing Database (CRD) using key information contained in the first message;
  - (c) forming a second message, that is based on the first message, using information returned by the CRD lookup operation; and

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- (d) routing the second message to one of a plurality of network elements that share the DPC value specified in the first message.

5 82. The computer program product of claim 81 wherein the first message is a Signaling System 7 (SS7) signaling message.

83. The computer program product of claim 82 wherein the SS7 signaling message is an ISDN User Part (ISUP) message.

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84. The computer program product of claim 81 wherein the key information used in the CRD lookup is a combination of DPC and CIC values contained in the first message.

15 85. The computer program product of claim 83 wherein the key information further includes the OPC value contained in the first message.

20 86. The computer program product of claim 81 wherein the information returned by the CRD database includes a network address.

87. The computer program product of claim 81 wherein the information returned by the CRD database includes an IP address and a port number.

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88. The computer program product of claim 81 wherein the information returned by the CRD database includes a status value that indicates the operational status of the second network element.
- 5 89. The computer program product of claim 81 further including generating a copy of the first message.
90. The computer program product of claim 89 comprising delivering the copy of the first message to an Accounting Subsystem associated with the CIC routing node.
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91. The computer program product of claim 89 comprising encapsulating the copy of the first message in an SCCP envelope and delivering the encapsulated message to an Accounting Subsystem associated with the CIC routing node.
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92. The computer program product of claim 90 wherein the Accounting Subsystem includes a usage and measurements application.
- 20 93. The computer program product of claim 90 wherein the Accounting Subsystem includes a billing application.
94. The computer program product of claim 81 wherein the plurality of network elements include Media Gateway Controllers (MGCs).



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